

## COLLECTING IN EL SALVADOR, WITH PARTICULAR REFERENCE TO SCARABAEOIDEA AND SILPHOIDEA (COLEOPTERA)

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The coleopterous fauna of El Salvador is poorly known. Only five collecting sites were mentioned in the "*Biologia Centrali-Americana*", and this neglect has not been subsequently rectified to any extent.\* Few coleopterists have more than casually collected there in recent years. Because little has been written about field entomology in El Salvador, we believe that the information we acquired on a recent collecting trip (Apr. 29 to May 15, 1971) may be of general interest.

### INTRODUCTION

El Salvador is geographically the smallest of the mainland American countries. It lies in northern Central America, bordered on the west by Guatemala, on the north and east by Honduras, and on the south by the Pacific Ocean. Along the eastern two-thirds of the Pacific coast is a fringe of flat coastal plain. Beyond the coast the land is hilly or mountainous, reaching a maximum elevation of 2418 m. at Monte Cristo, with some broad flat interior valleys. The topography is a result of erosive processes working almost entirely on a substrate of late Tertiary volcanic rocks. Throughout much of the country, high, volcanic, cone-shaped mountains of Pleistocene or recent origin dominate the skyline. Rainfall is seasonal, with the rainy season occurring generally from late May to October. August is a "little dry season" having some rain but less than in either July or September. Maximum daytime temperatures (in Fahrenheit) range from the low 90's along the coast to the low 70's at higher elevations.

On this varied tropical land of 8236 square miles lives a population of 3,100,000 inhabitants (1969 estimate, Fact Book). Two-thirds of the people are rural with a density of about 400 per square mile. The economy of the country is based on subsistence agriculture, and consequently the people have a low standard of living. Much of the land, especially the flat coastal plain, is used for crops and grazing and there are a few large, fairly modern farms. However, most of the people support themselves on small land plots using primitive and inefficient agricultural tools and techniques, including slash-burn cultivation.

The conditions in El Salvador, with an agricultural system which leads to ecological instability and habitat destruction (coupled with a high population density), would make a biologist predict poor collecting. The biologically bleak picture was reinforced for us by stories of intensive and

\*There is a published list of the insects of El Salvador: Berry, P. A. and M. Salazar V. 1957. Lista de insectos clasificados de El Salvador. Servicio Cooperativo Agrícola Salvadoreño Americano (SCASA). Bull. 21:1-134. In it 55 species of Scarabaeidae are listed on p. 42-47. We far exceeded this number in 2 weeks of collecting, so that, at least for our groups, we feel that our statement is correct.

indiscriminate use of insecticides by agriculture, especially on the coastal plain (Janzen 1970).

It was with dim expectation of finding anything more than pest, weed, and trash species that we decided to spend the first 2 weeks of May in El Salvador. We believe it is valuable for us to record our impressions, both to correct the misimpressions that we had beforehand (and that others seem to have) and to record conditions to provide a guideline against which changes may be measured. Also, it is difficult to find collecting sites in some areas and it is hoped that our notes on localities may assist future collectors. The best earlier treatment we know of on localities and habitats in El Salvador is that of Dickey and Rossen (1938). Additional helpful habitat and locality information is in Burt and Stirton (1961).

#### ACKNOWLEDGMENTS

A number of people assisted us during our stay in El Salvador. We would particularly like to thank Dr. and Mrs. S. Breeland, San Salvador, who not only furnished us accommodations, but tolerated Berlese funnels on the patio and a black-light on the roof. In addition, Dr. Breeland, along with other personnel of the Central American Malaria Research Unit, aided us greatly by taking us to some of the coastal localities, furnishing transport and some equipment. Mr. and Mrs. Stephen Steinhauer, Santa Tecla, were responsible for all arrangements and accompanied us on our visit to Cerro Monte Cristo. Dr. Francisco Cerano and Victor Hellebuyec arranged for transportation through the University in San Salvador for one of our visits to Cerro Verde. The help so freely given by everyone contributed greatly to the success of our trip.

#### GENERAL CONSIDERATIONS

With the exception of the city of San Salvador, El Salvador is not developed for tourism. Air connections to San Salvador are satisfactory and

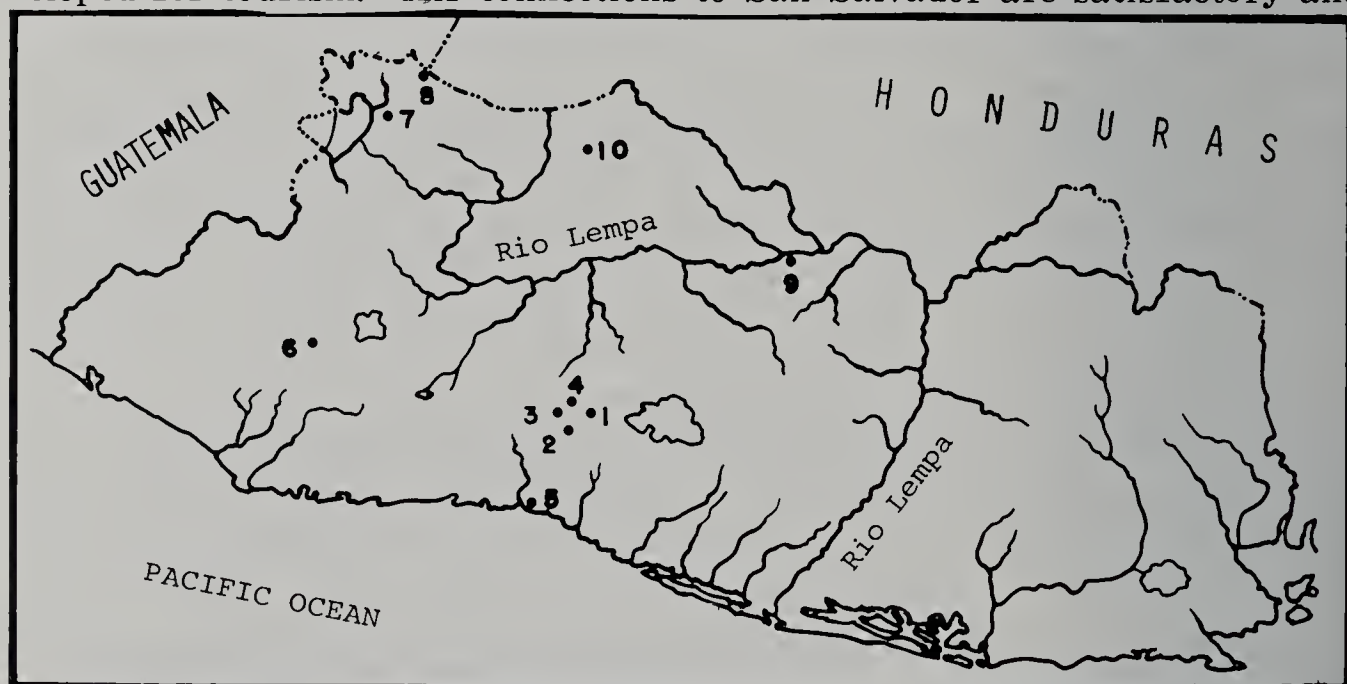


Fig. 1. Map of El Salvador showing collecting localities: 1, San Salvador. 2, Santa Tecla. 3, Los Chorros. 4, Boqueron. 5, La Libertad. 6, Cerro Verde. 7, Metapan. 8, Cerro Monte Cristo. 9, Presa 5 de Noviembre. 10, La Palma.



rental vehicles, including Volkswagons and 4-wheel drive "jeeps" are obtainable at approximately U. S. rates. The rural road system is fair, a V.W. being suitable for all localities visited with the exception of Cerro Monte Cristo and possibly Boqueron. In these 2 areas, 4-wheel drive is desirable and necessary in the rainy season, at least for Monte Cristo.

The localities visited and our impressions of them are influenced by what we collected, which was in turn influenced by the moisture conditions (the rainy season was just beginning and Boqueron and the La Libertad areas were still very dry). Our major efforts were to obtain material, primarily Scarabaeoidea (H.F.H.) and Silphoidea (S.B.P., particularly Silphidae, Catopidae and Leiodidae) that would be useful for our systematic and biogeographic studies. A variety of collecting techniques were employed including beating of vegetation, black-light trapping, Berlese funnel extraction of sifted litter, and pitfall traps baited with carrion and feces. Litter was generally nonexistent (as is frequently the case in lowland tropical areas) or very dry during our visit. Only 4 localities were found with suitable litter conditions and a total of 116 liters, measured after being sifted through  $\frac{1}{2}$  inch mesh screen, were extracted in the funnels. A total of 21 pitfall traps were placed in 6 forested areas for a total effective trapping time of 35 days. Five of these days were lost because of human or animal interference with the traps. Also, moonlight (full moon on May 8) and heavy rain interfered with light trapping in several localities.

First, the areas we saw and in which we collected will be described. This will be followed by our evaluations of them, using the map (Fig. 1) for orientation in our discussion.

#### SAN SALVADOR - SANTA TECLA AREA

*San Salvador*, # 1 on map, elevation about 900 meters: The capital city which is surrounded by extensive suburban areas. We stayed in Colonia Escalon which is completely built-up, the vegetation consisting almost entirely of lawns and ornamentals. A black-light was operated in the Bree-land's yard for 4 nights during our stay.

*Santa Tecla* (Called Nueva San Salvador on some maps), # 2 on map, elevation about 900 m: A small city situated about 8 km. west of San Salvador. The black-light was operated 1 night in a suburban area approximately 200 feet from the edge of a hillside covered with some native trees and an understory of coffee.

*Los Chorros*, # 3 on map, elevation about 800 m: This is a bathing and picnicking spot, 4 km. west of Santa Tecla on the road to Santa Ana. The Los Chorros Park is a beautifully landscaped and planted mouth of a canyon, containing bathing pools fed by springs and seepage areas coming from volcanic rock cliffs walling the canyon. In the Park only the trails on the north canyon wall provide access to some natural vegetation. A trail leading up the canyon shortly comes to the end of the park, and continues as the bed of an intermittent-stream. Here the canyon walls rise vertically for 30 m. or more in volcanic rock. The vegetation is disturbed on the canyon bottom by wood cutters and grazing cattle, but the vegetation on the canyon walls is natural. A few tree ferns occur there. The narrow nature of the canyon aids in keeping it cool and more moist than

the surrounding hills in the dry season. Butterflies, and presumably other insects concentrate here in the dry season. Sampling techniques consisted of general collecting, baited pitfall traps, and sifting rotting leaves and fig fruits found in damp areas near the base of the cliffs. The pitfall traps yielded a disappointingly small sample of scarabs and one catopid.

Across the highway from the Park is a larger stream canyon with some forest on its steep walls. We were told this is a good collecting area, but did nothing more than look at it. In this same canyon, 1 km. closer to Santa Tecla we operated a black-light 1 evening and were surprised at the large number of beetles, including a total of 31 species of scarabs. In this region the hills are partly cultivated with coffee, with native trees preserved as an overstory providing shade for the coffee.

*Boqueron*, # 4 on map, elevation 1885 m: This is the summit area of Volcan San Salvador, reached from Santa Tecla by a poor road of volcanic ash and stones. The summit is a popular picnic area. The mountain is mostly planted in coffee, almost to the summit. Only a few remnant trees of the original forest cover are present. A large, fairly old planting of conifers occurs at the end of the road just below the summit. The area was very dry, largely limiting collecting to pitfall traps and black-lighting.

#### LA LIBERTAD AREA

*La Libertad*, # 5 on map, elevation 10 m: This coastal city is 24 km south of Santa Tecla on a good paved highway. There are two vegetational types nearby. To the west of La Libertad the coastal highway has been completed in the past few years. It winds around hills that plunge directly into the sea. The soil is generally rocky and extremely poor for agriculture. Much of the vegetation is virgin tropical lowland deciduous or seasonal forest. It had not begun to leaf out by May 14, but a rain on the last day of our visit released numbers of small insects (mostly ants) that swarmed to the blacklight. We would expect much better collecting a week or 2 later.

Exactly 20 km. to the east of the junction of highways 4 and 2 at La Libertad is Hacienda La Cangrejera. There is a large tract of relatively undisturbed lowland tropical evergreen forest here. There has been some selected cutting but perhaps 100 acres of relatively good forest occurs in a strip behind an extensive stand of coastal mangrove. The forest is locally referred to as rain forest, but this term seems poorly chosen because the area does have a definite dry season which had not ended when we were there. The road leading from the highway through the entrance gates can be followed straight back to the south, across fields to the forest, a distance of about 4 km. Pitfall trapping yielded little, demonstrating that the ground fauna was affected by the dryness. This was also true for beating and, to a lesser extent, for black-lighting.

#### CERRO VERDE AREA

*Cerro Verde*, # 6 on map, elevation 2000 m: This volcano rises to the west of Lake Coatepeque and lies between Volcan Santa Ana (2381 m) and Volcan Izalco (1830 m). A good all-weather gravel road provides easy access to the summit. There is a nearly completed hotel just below



the summit overlooking Volcan Izalco. Izalco was erupting regularly and the hotel was planned so that visitors could view the eruptions. Just as the hotel was essentially finished the eruptions terminated. The hotel has never opened although the grounds and gardens are well kept. Except for the hotel grounds, the top 300 meters of Cerro Verde are well forested with good stands of mixed broadleaves, including oak. There are areas of deep litter covering very porous volcanic soil. Beating, blacklighting, pitfall traps and sifting litter all were quite successful. Moisture conditions were good, rains being fairly frequent there during our visit.

#### METAPAN AREA

*Metapan*, # 7 on map, elevation 8-900 m: This town is reached by an all-weather, unpaved road leading north from Santa Ana. On the east side of the road, about 8 km. south of Metapan is an extensive stand of relatively undisturbed, mature deciduous forest. The forest, which was just leafing out on May 10, occurs on a lava flow 1000 to 2000 years old. While we did not collect there, it should be good for flower and leaf feeding beetles, but the lack of mature soil probably precludes any extensive soil or litter fauna.

#### MONTE CRISTO AREA

*Cerro Monte Cristo*, # 8 on map, elevation 2300 m: Just at the southern edge of Metapan a dirt road (trail might be a better word) leaves the main road on the right hand side just before a large uncompleted building resembling a theater or opera house. This is the road to Cerro Monte Cristo, also called Cerro Miro Mundo or Trifino. Just after the turn and at several places further on there are forks in the road, and it is best to ask directions to get to the Hacienda Monte Cristo. After the first few kilometers don't take any fork going abruptly down hill. The road itself might be passable to small cars or pick-up trucks during the dry season, but we advise taking a 4-wheel drive vehicle. During the relatively frequent rains, portions of the road that consisted of red clay became very slippery and were difficult to negotiate in a Land Rover. However, the clay dried quickly after a rain. From the Metapan turnoff the first 9 km. of the road traversed heavily cut-over hills. It then entered a mixed pine-oak zone with scattered huts and some coffee on lower slopes. At km 12 and at an elevation of approximately 1200 m and still in the pine-oak zone we operated the black-light for 45 minutes with excellent results. Just beyond, the road crosses several ravines containing temperate deciduous trees such as sweet gum (*Liquidambar*) and hop hornbeam (*Ostrya*). At km 16 at an elevation of 1800 m the pine-oak forest becomes mixed with other broadleaves of unfamiliar genera. One km further the pine ends in a region of cut-over slopes with some reforestation in planted *Cedrus*. This is Hacienda Los Planes. At km 20 the road enters an undisturbed broad-leaf cloud forest with oak predominating and tree ferns forming a conspicuous component of the understory. At km 23 at an elevation of 2300 m the road essentially ends at the building of the Hacienda Monte Cristo. Several acres of cut over land surround the buildings, but the surrounding forest is largely undisturbed. It is possible to camp along the road before

reaching the Hacienda and it is also possible to make arrangements to stay at the Hacienda. However, food, bedding, and any equipment and supplies should be brought in.

Collecting in general was good for the 3 days we were there, but we were somewhat hampered by frequent rains, particularly in the evening. This would probably be the case during the entire rainy season. Judging from the number of tree ferns and epiphytes, there is probably not a serious deficiency of moisture at any time during the year. However, in the pine-oak zone at lower elevations it was obvious that the rains had just started a week or so earlier (about May 1).

#### NORTH-CENTRAL AREA

*Presa 5 de Noviembre*, # 9 on map, elevation about 500 m: This is a dam site reached by a secondary road extending north from the Inter-american highway, the turnoff located to the east of Cojutepeque. The road is paved only to Ilobasco, then gravel. The countryside is extremely cut-over to Ilobasco. Shortly beyond, it winds downward into a hilly, dry interior valley that is now largely grassland with scattered acacias. Near the dam along the impounded lake there is some scrubby deciduous forest, but the area was obviously too dry for collecting during our visit. The actual dam site is under military control and permission would be needed to enter.

*La Palma*, # 10 on map, elevation about 1200 m: The town of La Palma is in a mountainous area near the Honduran border and is reached by a paved highway running north from San Salvador. On the road between Aguilares and the Rio Lempa, stands of broad-leafed evergreen forest were visible about  $\frac{1}{2}$  mile from the highway. They appeared to be good collecting sites but we did not have time to investigate. Before reaching La Palma the road crosses 2 forested mountain ridges (about 15 and 5 km. south respectively). The forest consists mostly of pine and oak with a relatively open understory. The area was fairly dry with little litter, but an attempt to black-light was halted by heavy rains. Under better conditions, collecting should be very good. Also, better collecting should be found near here if the effort is made to take trails to higher elevations.

#### GENERAL OBSERVATIONS AND CONCLUSIONS

Good collecting localities in El Salvador are difficult, but not impossible, to find. The central and southern portions of the country have been extensively altered by the activities of man, but in many areas a fairly rich fauna has managed to survive. This survival is partly due to the numerous coffee fincas, because the need for shade trees over the coffee necessitates the preservation of canopy trees. This often maintains the mixed species composition of the original forest and preserves the diversity of many groups of phytophagous insects. Also the shade allows survival of the litter and soil fauna that would be eliminated by clearing. We could find no one that knew of any extensive use of insecticides on the coffee.

The extensive use of insecticide on coastal cotton as described by Jan-





Fig. 2: H. F. Howden in lowland tropical evergreen forest 20 km. E. La Libertad at the Hacienda Cangrejera.

Fig. 3: S. B. Peck in understory of oak-cloud forest showing tree ferns, moss and other epiphytes on trunks and thick, wet litter, 2300 m. elevation at km. 22 near Hacienda Monte Cristo.



TABLE 1: SUMMARY OF COLLECTING DATA FOR SCARABAEIDAE TAKEN AT BLACKLIGHT.

LOCALITY	GENERIC NAME—(ROMAN) EST. # OF SPP. —(ARABIC) # OF GENERA	"TRASH" SPP. # OF SPECIES	TYPE OF HABITAT	NOTES
San Salvador, 900m., 4 nights	(4) II-2; X-2; XI-2; XXI-3	9 (7) (not XI)	well kept suburban lawns & ornamentals	light in well kept backyard
Santa Tecla, 900m., 1 night	(7) II-5; III-1; V-2; X-4; XII-1; XXIV-1; XXI-6	20 (11) II-2; III-1; V-1; X-4; XXI-3	suburban and coffee plantation	light 200 ft. from coffee forest trees
Boqueron, 1800m., 2 nights	(7) II-1; III-1; V-1; VI-1; XI-2; XIX-1; XXI-4	11 (2) III (sallei)-1; V-1	very dry-cut over hillside with planted (not native) pines	volcanic soil 3/4 moon
Cerro Verde, 2000m., 2 nights	(5) II-2; XV-1; XXI-3; XXV-1; XXVII-1	8 (0)	moderately wet mixed broad-leaf forest	cool—some rain nearly full moon
C. Monte Cristo, 2300m., 2 nights	(10) I-1; II-2; III-1; IV-1; XI-2; XIII-1; XV-1; XVII-1; XXI-6; XXVII-1	17 (1) III (sallei)	wet mixed forest—tree ferns	intermittent rain
C. Monte Cristo, 1200m., 1 night	(8) II-6; III-1; V-1; X-2; XII-1; XXIV-1; XXI-6; XXVII-1	19 (5) II-2; III-1; V-1; X-1	oak-pine forest moist	3/4 hr. run of light
Los Chorros, 800m., 1 night	(13) II-6; III-2; V-6; VII-1; X-4; XI-2; XII-1; XVIII-1; XXI-3; XXII-1; XXIII-1; XXVI-2; XXVII-1	31 (11) II-2; III-2; V-1; X-4; XXI-2	wet ravine & stream mixed natural forest	1½ hrs. run of light before full moon up
20 km. E. La Libertad, 10m., 2 nights	(8) V-2; VII-2; VIII-1; X-2; XI-1; XVI-1; XX-1; XXI-2	12 (5) V-1; VII-1; X-2; XVI-1	very dry—tropical evergreen forest	1 night nearly full moon
12 km. W. La Libertad, 20m., 1 night	(8) II-2; V-5; VII-1; IX-1; X-1; XXI-1; XXIII-1	13 (4) II-1; V-1; VII-1; X-1	deciduous lowland forest	night after first rain of season
La Palma, 1200m., 1 night	(4) II-2; XI-1; XIV-1; XXI-3	7 (0)	oak-pine forest	light run 1/2 hr. in hard rain

## NUMBERS FOR GENERIC NAMES

I—*Ancognatha*; II—*Anomala*; III—*Aphodius*; IV—*Aspidolea*; V—*Atenius*; VI—*Bolborhombus*; VII—*Bothynus*; VIII—*Canthidium*; IX—*Copris*; X—*Cyclocephala*; XI—*Diploptaris*; XII—*Enema*; XIII—*Heterosternus*; XIV—*Hoplia*; XV—*Ochodaeus*; XVI—*Onthophagus*; XVII—*Orizabus* (*Cheiroplatys*); XVIII—*Paraspidolea*; XIX—*Pelidnota*; XX—*Phileurus*; XXI—*Phyllophaga*; XXII—*Pleurophorus*; XXIII—*Psammodius*; XXIV—*Spodistes* (*Lycomedes*); XXV—*Strategus*; XXVI—*Trox*; XXVII—*Xyloryctes*.



TABLE 2: SUMMARY OF "SILPHOID" BEETLES COLLECTED IN EL SALVADOR, WITH HABITATS, AND COLLECTING METHODS.

LOCALITY	"BAIT"	TAXA COLLECTED										TRAPS	LITTER	
		Silphidae		Catopinae			Leiodidae			Leiodinae				
Monte Cristo	carion	<i>Silpha</i> <i>cayanensis</i>												
2300 m	dung	<i>Necrophorus</i> <i>quadrимaculatus</i>												
		<i>Necrophorus</i> <i>mexicanus</i>											8	
		<i>Dissochaetus</i> species 1												
		<i>Dissochaetus</i> species 2												
		<i>Dissochaetus</i> species 3											5	
		<i>Dissochaetus</i> species 4											6	
		<i>Ptomaphagus</i> spp.												
		<i>Aglyptinus</i> spp.												
		<i>Agathidium</i>												
													# of traps	
													# of days	
													kg. of litter	
													liters of litter	
Monte Cristo	carion												2	2
2300 m	dung												2	2
	</													

zen (1970), where 20-30 applications of parathion may be used, may occur in the lowlands east of La Libertad, but we found a fairly rich fauna in the forest to the east of La Libertad. Malaria control measures may have reduced the aquatic fauna, and the control of malaria has certainly sped the destruction of the evergreen tropical forest for agricultural purposes. However, the malaria mosquitoes have now developed resistance to the usual chemical controls, and malaria is again a health problem on the coast.

Our observations indicate that while there has been considerable disturbance by man it is still not as severe as in some other areas such as the valley of Mexico, or the originally forested coastal plain of the eastern United States where native undisturbed forest is equally difficult to find. There is still an interesting and diverse insect fauna in El Salvador. There are probably few species limited to El Salvador, but some habitats may be more difficult to reach in the surrounding countries. The Monte Cristo-Metapan area and probably the area near La Palma contain species restricted to the Guatemalan uplift. The volcanic band, including Cerro Verde and Boqueron, have a somewhat reduced fauna, perhaps due partly to their isolation and partly to relatively recent volcanic activity. Also, their very porous, immature soils may not support some groups. Intermediate elevations with more mature soils, Santa Tecla and Los Chorros for example, support a rich fauna. We suspect this is also true of the coastal areas where we feel that our collecting was hindered by dryness. Table 1 summarizes the number of genera and species of Scarabaeidae taken at the blacklight. This does not include species taken by other methods. A total of approximately 45 species of Scarabaeidae was taken at Los Chorros by blacklight, pitfall traps, and general collecting in a 24 hour period. There are few places in Central America where a similar length of time would yield a greater number of species. Table 2 is a summary of numbers of "silphoid" beetles taken, combined with habitats and collecting methods. These beetles were found to be more numerous at the higher elevations, and in more moist habitats.

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AN INTRODUCED BUPRESTID IN NEW JERSEY: In looking over material collected by R. L. Jacques, I found a vial of beetles with bright green elytra, shiny cupreous head and pronotum, and 3 to 3.5mm long. Suspecting that they were introduced, I consulted a volume on French beetles where they easily keyed out to *Trachys pygmaeus* Fab. They were collected on hollyhock, along with *Apion longirostre* Oliv., at Irvington, New Jersey, 22-VI-70. In Europe it is found on plants of the family Malvaceae, in which family the hollyhock belongs. (N. M. Downie)